

Space Toxicology Challenges and Ethical Considerations

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Before delineating specific ways that nanotechnology enterprises might contribute to better management of toxicological risks during spaceflight, I will show how ethical considerations and several theories of justice can be applied to nanotechnology strategic plans. The principles that guide an ethical technical enterprise include autonomy, beneficence, non-maleficence, veracity and justice. Veracity (truth) is the underpinning principle; however, beyond this, proponents of nanotechnology must think carefully about balancing conflicting principles. For example, autonomy must yield to beneficence when fearful individuals simply lack knowledge to appreciate nanotechnology's beneficial advances. Justice is a complex topic upon which I will place six models: utilitarian, distributive, free-exchange/choice, individual dignity (social participation), equity vs. greed, and liberation of the poor. After briefly summarizing each model, I will present what I call an iterative-hybrid model of justice to show specifically how our thinking can be applied to nanotechnology enterprises. Within that broad landscape, I will discuss a single feature: how our early effort to understand health risks of carbon nanotubes fits into the iterative model. Finally, I will suggest ways that nanotechnology might advance our management of toxicological risks during spaceflight, but always with an eye toward how such advances might result in a more just world.